REMARKS

This amendment is responsive to the Office Action dated February 3, 2006. Claims 1 – 3, 5 – 13, 21 – 31, 33 – 38, 49, 50, 63 – 66, 68 and 81 – 88 are pending in this application and have been rejected. Reexamination is respectfully requested in light of the foregoing amendments in the claims and following remarks.

In the outstanding Office Action the Examiner has rejected claims 1 – 3, 5 – 13, 21 – 31, 33 – 38, 49, 50, 63 – 66, 68 and 81 – 88 under 35 USC § 103(a) as being unpatentable over Yasutimi '100, Carter-Coman '207 and Gee '874.

Summary

All Claims are not obvious on the basis of Yasutimi, Carter-Coman and Gee for the following reasons.

First Yasutimi only discloses Au as a material for the reflective layer, and gives no disclosure of Pd/Ag, Ag, Ru, Rh, Re, Os, Ir and Pt as materials for the reflective layer of the present invention, as the Examiner noted.

Carter-Coman discloses a concept that a device chip having a reflective metal layer 34 and a diffusion-barrier 36 is bonded directly to a platform 40 of the lamp on the diffusion-barrier 36 side through a soldering layer 38, thus lacks a concept of bonding a device layer to a reflective metal layer. A light-emitting layer 28 formed by epitaxial growth is so thin (the upper thickness limit is around 20 μm), that it cannot even be

bonded to the platform 40 without the device substrate.

The comparison of each Claim will be discussed below. Accordingly Carter-Coman, having no conductive device substrate (such as Si substrate) is essentially different from the present invention.

Gee does not disclose on ohmic contact and has a sapphire substrate which is an insulating material. Still further, Gee only discloses a light emitting layer composed of GaN. The claims as now amended now all recite light emitting layers composed of $(Al_xGa_{1-x})_yIn_{1-y}P$ (where, $0 \leq x \leq 1$ and $0 \leq y \leq 1$). This is not suggested by Gee.

Claim 1

As a light-emitting-layer- portion-side contact layer, Applicant uses an Ag base layer instead of a conventionally-used Au base layer (Applicant's Fig.1: 132). This is not only beneficial in lowering the contact resistance similar to the Au-base contact layer, but also in lowering costs for forming the contact layer as compared with the case where the Au-base contact layer is used. The Ag-base contact layer is also less likely to absorb light in shorter wavelength region, unlike the Au-base contact layer.

The Examiner fails to recognize that Applicant's ohmic contact 132 (Applicant's Fig. 1) is Ag-base in this invention.

Carter-Coman does not disclose the materials comprising the ohmic contact 32, so that it obviously does not suggest or teach use of Ag.

Gee does not disclose an ohmic contact.

Claim 1 and its dependent Claims 2, 5, 6, 7, 8 9 and 10 are, therefore, by not obvious in view of Carter-Coman, Yasutimi and Gee.

Amended Claim 10

Claim 10 has been amended to be dependent from Claim 1.

Claim 11

Claim 11 is limited to a configuration in which a conductive semiconductor substrate is used as the device substrate, and the substrate-side, Ag-base contact layer having Ag as a major component is formed between the device substrate and the Ag-base reflective metal layer (Applicant's Fig. 1: Ag-base layer 131). This makes it possible to lower the contact resistance between the substrate and the Ag-base reflective metal layer, and also to configure the device at low costs because the Au-base contact layer is unnecessary. This advantage is not recognized or suggested by the art of record.

Carter-Coman discloses a soldering layer 38 in direct contact with a diffusion barrier 36, but there is no disclosure of an Ag-base layer 131 of the present invention in Fig.1 (substrate-side Ag-base contact layer).

Gee discloses a sapphire substrate, which is an insulating material, so that

provision of the contact layer is technically pointless (therefore, a substrate-side Ag-base contact layer is obviously not provided). For this reason, the combination of claim 11 that requires that the material be conductive is not suggested.

Claim 21

Claim 21 is similar to the previous Claim 1. The Ag-base contact layer based on the same concept where the light-emitting-portion-side, Ag-base contact layer, is provided between the main back surface of the light emitting layer portion (or the transparent compound semiconductor layer), and the Ag-base reflective metal layer.

As pointed out with respect to claim 1, the Examiner fails to recognize that ohmic contact 132 (Figure 1) is Ag-based in this invention.

Carter-Coman does not disclose materials composing the ohmic contact 32, so that it cannot teach or suggest Ag.

Gee does not disclose ohmic contact.

Claim 21 and its dependent claims 23 to 29 are, therefore, not obvious in view of Carter-Coman, Yasutimi and Gee.

Claim 30

Claim 30 relates to materials composing an Ag base contact layer.

Carter-Coman does not disclose materials composing an ohmic contact 32, so that it is obviously not Ag-based.

Claim 30 is not suggested by the combination of Carter-Coman, Yasutimi and Gee.

Claim 31

Claim 31 provides an inventive subject matter limited as having a configuration in which the substrate-side contact metal layer, reducing the contact resistance between the device substrate and the diffusion-blocking layer, is interposed between the diffusion-blocking layer and the device substrate (Fig. 1: Ag-base layer 131). This makes it possible to lower the contact resistance between the diffusion-blocking layer composed of a conductive material and the device substrate, and to effectively suppress excessive rise in the series resistance and forward voltage of the light emitting device, despite the diffusion-blocking layer is additionally interposed.

Carter-Coman discloses a soldering layer 38 directly contacted to a diffusion barrier 36, but gives no disclosure of an Ag-base layer 131 of the present invention in Fig.1 (substrate-side Ag-base contact layer).

Gee discloses a sapphire substrate, which is an insulating material, so that provision of the contact layer is technically pointless (therefore, a substrate-side Ag-base contact layer is obviously not provided). For this reason, the combination of claim 31 which requires the material to be conductive is not suggested.

Amended Claim 38

Amended Claim 38 provides limitation to a configuration in which the device substrate is a Si substrate, and with respect to the main metal layer, a portion thereof including the interface with the diffusion-blocking layer is composed of an Au-base metal layer containing pure Au or 95% or higher Au, and a portion thereof forming the compound-semiconductor-layer-side reflective surface is composed of an Ag-base layer. Use of the Ag-base layer for the portion forming the reflective surface makes it possible to raise the reflectivity with respect to the flux of emitted light, and use of the Au-base metal layer, which is soft and readily bondable, on the side brought into contact with the diffusion-blocking layer makes it possible to readily bond without melting process, while placing the main metal layer in between, the compound semiconductor layer and the diffusion-blocking layer on the device substrate side.

Carter-Coman discloses no device substrate.

Amended Claim 38 is, therefore, not obvious in view of Carter-Coman, Yasutimi and Gee.

Claim 49

Claim 49 is limited to Metals composing the reflective metal layer having only any one of Ru, Rh, Re, Os, Ir and Pt as a major component (Fig.1 : 10a). Ru, Rh, Re, Os, Ir and Pt have reflectivity equivalent to that of Ag, and raise no fear of sulfurization-

or oxidation-induced degradation in the reflectivity, unlike Au.

Carter-Coman and Gee only disclose an Ag base or an Ag-Pd base reflective metal layer having only a single Ag layer as the main metal layer. There is no disclosure of a concept of composing the reflective metal layer with a metal having any one of Ru, Rh, Re, Os, Ir and Pt as a major component anywhere in the specification and the attached drawings. Claim 49 and it's dependent claim 50 are, therefore, not obvious our suggested by Carter-Coman, Yasutimi and Gee.

Claim 63

Claim 63 is limited to providing a protective metal layer between the Ag-base reflective metal layer and the light emitting layer portion (Fig.9: 310a). Provision of the protective metal layer makes it possible to effectively prevent oxidation and sulfurization of the Ag-base reflective metal layer.

Carter-Coman and Gee give no disclosure on a concept of providing such a protective metal layer, anywhere in the specifications and the attached drawings. Claim 63 and its dependent Claims 64 and 65 are, therefore, not obvious because there is no suggestion in Carter-Coman, Yasutimi and Gee.

Amended Claim 66

Amended Claim 66 limits the reflective metal layer to a composition of a metal

having any one of Ag, Ru, Rh, Re, Os, Ir and Pt as a major component and has a configuration in which the reflective metal layer is bonded to the device substrate composed of a semiconductor, while placing the bonding-use metal layer, containing pure Au or 95% or higher Au, in between. The bonding-use metal layer having Au as a major component is less susceptible to oxidation and so forth, and can more readily ensure a necessary bonding force with the device substrate.

Carter-Coman discloses no device substrate, thus no concept of bonding a reflective metal layer to a device substrate through a bonding-use metal layer.

Amended Claim 66 and its dependent 68 are, therefore, not suggested by Carter-Coman, Yasutimi and Gee.

Claim 81

Claim 81 has a configuration of bonding a reflective layer to a Si substrate as a device substrate through a Si-diffusion-blocking layer composed of Sn, Pb, In or Ga. The materials of the diffusion-blocking layer can effectively prevent diffusion of Si on the light-emitting layer side from the Si substrate, so as not to lower reflectivity of the reflective layer by Si staining thereof.

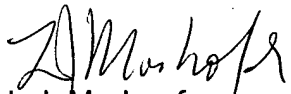
Carter-Coman discloses no substrate, and a diffusion-barrier 36 composed of Ni or the like, and totally different from Sn, Pb, In or Ga.

Gee discloses a sapphire substrate not a Si substrate, accordingly no provision of a Si-diffusion-blocking layer composed of Sn, Pb, In or Ga either.

Claim 81 and its dependent Claims 82, 83, 84, 85, 86, 87 and 88 are, therefore, by no means rejected on the basis of Carter-Coman, Yasutimi and Gee.

In view of the foregoing, it is respectfully submitted that the application is now in condition for allowance, and early action in accordance thereof is requested. In the event there is any reason why the application cannot be allowed in this current condition, it is respectfully requested that the Examiner contact the undersigned at the number listed below to resolve any problems by Interview or Examiner's Amendment.

Respectfully submitted,



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